WHAT IS CLAIMED IS:

- 1. A method for forming an isolation film for semiconductor devices, which comprises the steps of:
- 5 successively forming a first oxide film and a nitride film on a semiconductor substrate;

patterning the nitride film and the first oxide film to expose a portion of the semiconductor substrate, which corresponds to an isolation region;

implanting impurity ions into the exposed portion of the semiconductor substrate to form an impurity ion-implanted layer;

forming a spacer at the sidewall of the patterned nitride film, and at the same time, etching the ion-implanted layer using the spacer as a mask;

etching a portion of the semiconductor substrate exposed by the etching of the ion-implanted layer, using the spacer as a mask, thereby forming a trench;

removing the spacer;

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annealing the trench so that the corner of the trench is rounded;

forming a second oxide film along the inner wall of the trench;

depositing a polarizing oxide film on the entire

surface of the resulting substrate in such a manner as to gap fill the trench;

subjecting the polarizing oxide film to chemical mechanical polishing (CMP) using the nitride film as a polishing stopper film, thereby polarizing the polarizing oxide film; and

removing the nitride and first nitride films remaining after the polarizing step.

- 2. The method of Claim 1, wherein the step of patterning the nitride film and the first oxide film is carried out by dry-etching with an activated plasma consisting of a gas mixture of CHF_3 , CF_4 , Ar and O_2 .
- 3. The method of Claim 1, wherein the step of patterning the nitride film and the first oxide film is carried out by dry-etching with an activated plasma consisting of a gas mixture of CHF3, CF_4 , Ar, O_2 and C_xF_y .
- 20 4. The method of Claim 1, wherein the impurity ions are phosphorus or boron ions.
 - 5. The method of Claim 1, wherein the spacer is made of polymer.

- 6. The method of Claim 1, wherein the etching of the ion-implanted layer provides an ion-implanted residual layer, which is formed by a multi-step dry etching process using the spacer as a mask.
 - 7. The method of Claim 6, wherein the surface of the ion-implanted residual layer is rounded.
- 8. The method of Claim 6, wherein the multi-step dry etching process is carried out using a gas containing fluorine of a given amount as a main component.
- 9. The method of Claim 8, wherein the flow rate of 15 fluorine is gradually increased as the multi-step dry etching process is progressed.
- 10. The method of Claim 8, wherein the flow rate of fluorine is gradually reduced as the multi-step dry etching 20 process is progressed.
 - 11. The method of Claim 1, wherein the step of etching the ion-implanted layer is carried out by dry etching with an activated plasma consisting of a gas mixture of CHF_3 , CF_4 ,

Ar and O_2 .

- 12. The method of Claim 1, wherein the step of etching the ion-implanted layer is carried out by dry etching with an activated plasma consisting of a gas mixture of CHF₃, CF₄, Ar, C_xF_y , N_2 and H_2 .
- 13. The method of Claim 1, wherein the step of forming the trench is carried out by dry-etching the substrate with 10 an activated plasma consisting of a gas mixture of HBr, Cl_2 , O_2 and H_2 .
- 14. The method of Claim 1, wherein the step of removing the spacer is carried out with a cleaning solution containing HF or H_2SO_4 .
 - 15. The method of Claim 1, wherein the second oxide film is a sacrificial oxide film acting to compensate for the damage of the trench inner wall.

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- 16. The method of Claim 1, wherein the remaining nitride film is removed by phosphoric acid dipping.
 - 17. The method of Claim 1, wherein the isolation film

is formed along the rounded corner of the trench.

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